

Final



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AUG 31 1989
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**Technical Support Document
For Record Of Decision
Cape Lisburne, AFS**

Prepared for

**USAF OEHL
Brooks, AFB, Texas**

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February 29, 1988

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FINAL

INSTALLATION RESTORATION PROGRAM
TECHNICAL SUPPORT DOCUMENT
FOR RECORD OF DECISION
CAPE LISBURNE
LRRS SITE

Prepared for
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Brooks AFB, Texas

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RECORD OF DECISION

Installation: The Cape Lisburne AFS is located on a peninsula north of Kotzebue Sound on the Chukchi Sea, Alaska. The area is surrounded by steep, rocky terrain supporting an alpine tundra.

Scope of Decision: This record of decision and supplemental support document applies to six potential hazardous waste sites identified at Cape Lisburne, AK. The recommendations for all six sites are the same; therefore, a single document for the entire installation is warranted.

Statement of Basis: The findings and decisions on the Cape Lisburne AFS presented in this report are based on the following:

- > 1987 site visit by personnel of Woodward-Clyde Consultants and the U.S. Air Force.
- Comprehensive literature search and review.
- Information gathered from governmental regulatory agencies and a review of active environmental permits issued by state and federal agencies. The following permit has been issued for one site identified during Phase I:
 - > Certificate of Consistency issued for demolition of White Alice Site (Site 6).
- > Review of the physical, chemical and toxicological characteristics of suspected or known contaminants.
- Preliminary Assessment Form submitted by EPA.

Cape Lisburne AFS

Regulatory Agency Concerns: No written comments on Cape Lisburne AFS were received from ADEC or U.S. EPA which expressed concerns after the 1987 site visit. However, informal comments and suggestions from both agencies have been included in this document.

Description of Selected Remedy: For all six sites at Cape Lisburne AFS the selected remedy is "No Further Action." The reasons for this decision are:

- o For all six (6) sites at the Cape Lisburne AFS the risk of significant adverse effects to human health and the environment is negligible, acceptably low, or offset by other considerations.
- o Based on an evaluation of alternatives, the benefits of remedial action or further study do not significantly outweigh the risks presently existing at each site.
- o The costs of remedial action or further study is excessive relative to the derived benefit.

It is noted that the current active waste accumulation area at the Lower Camp is a facility which is currently permitted by the Alaska Department of Environmental Conservation and subject to stringent regulation. This site is not included in the scope of studies funded by the Defense Environmental Restoration Account (DERA). Mention of the site is included in this document for informative purposes only and recommendations or conclusions concerning the site are not part of the No Further Action Decision.

Information presented in this document supports a finding that there is no significant impact on human health or the environment from suspected or confirmed past contamination at the Cape Lisburne AFS. The recommended remedy is no further

Cape Lisburne AFS

action with regard to investigation or clean-up of six (6) sites identified as possible areas of contamination at the Air Force station.

Declarations: The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended, and the National Contingency Plan ACT (NCP) as amended, provide for Trustee and Regulatory Agencies to determine the appropriate actions at Federal facilities where oil or hazardous substances may have been used or disposed.


Based on the best, currently available information for all six (6) sites at Cape Lisburne AFS, the risk of significant adverse effects to human health and the environment is negligible, acceptably low, or offset by other considerations. Such considerations include avoidance of environmental damage resulting from further investigations or clean-up and absence of exposure to human receptors. In all cases, further clean-up activities would create a disproportionate amount of damage, especially to the fragile tundra ecosystem, relative to the amount of contamination which could be recovered and to other derived benefits. Other considerations include the absence of significant exposure to human receptors. In summary the "No Further Action" alternative will adequately protect public health, welfare, and the environment.

The Air Force determines that the action being taken is appropriate when balanced against the availability of Defense Environmental Restoration Act (DERA) or other monies for use at potentially contaminated sites. Specific attributes of the site that suggest or support the "No Further Action" alternative are as follows:

- o Deep permafrost and frozen soils preclude the possibility of significant vertical migration of potential contaminants.

Cape Lisburne AFS

- o The absence of significant migration pathways indicates that the mobility of potential contaminants is extremely limited.
- o Human health risks are negligible.
- o Contamination was not observed at any site.
- o No threatened or endangered species are known to use or exist on the installation.
- o No economically or commercially important species use or exist on the installation.
- o Unique or sensitive environmental areas and receptors will not be affected.
- o Drinking water supplies are not hydraulically connected to sites described in this document.



DAVID R. PAULSEN, Colonel, USAF
Commander, 11 TCG

7 MAR 88
Date

Cape Lisburne AFS

REVIEW AND CONCURRENCE:

Richard Cosmick
State of Alaska
Department of Environmental Conservation

9-26-88
Date

U.S. Environmental Protection Agency
Region 10, Alaska Operations Office

Date

Cape Lisburne AFS

REVIEW AND CONCURRENCE:

State of Alaska
Department of Environmental Conservation

Date

Jacques Guzman
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Region 10, Alaska Operations Office

29 Feb 1988
Date

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1.0 SUMMARY

1.1 INTRODUCTION

The Cape Lisburne AFS, located in Alaska, was investigated under Phase I of the Installation Restoration Program (IRP). The findings of that study indicated six potentially contaminated areas at the installation (Eng. Sci. 1985). The report recommended follow-up action for all sites. A 1987 field visit verified that clean up has occurred at several sites; no evidence of significant contamination was observed at the sites where cleanup activities had not occurred. The following document presents the information collected in support of no further action at Cape Lisburne AFS.

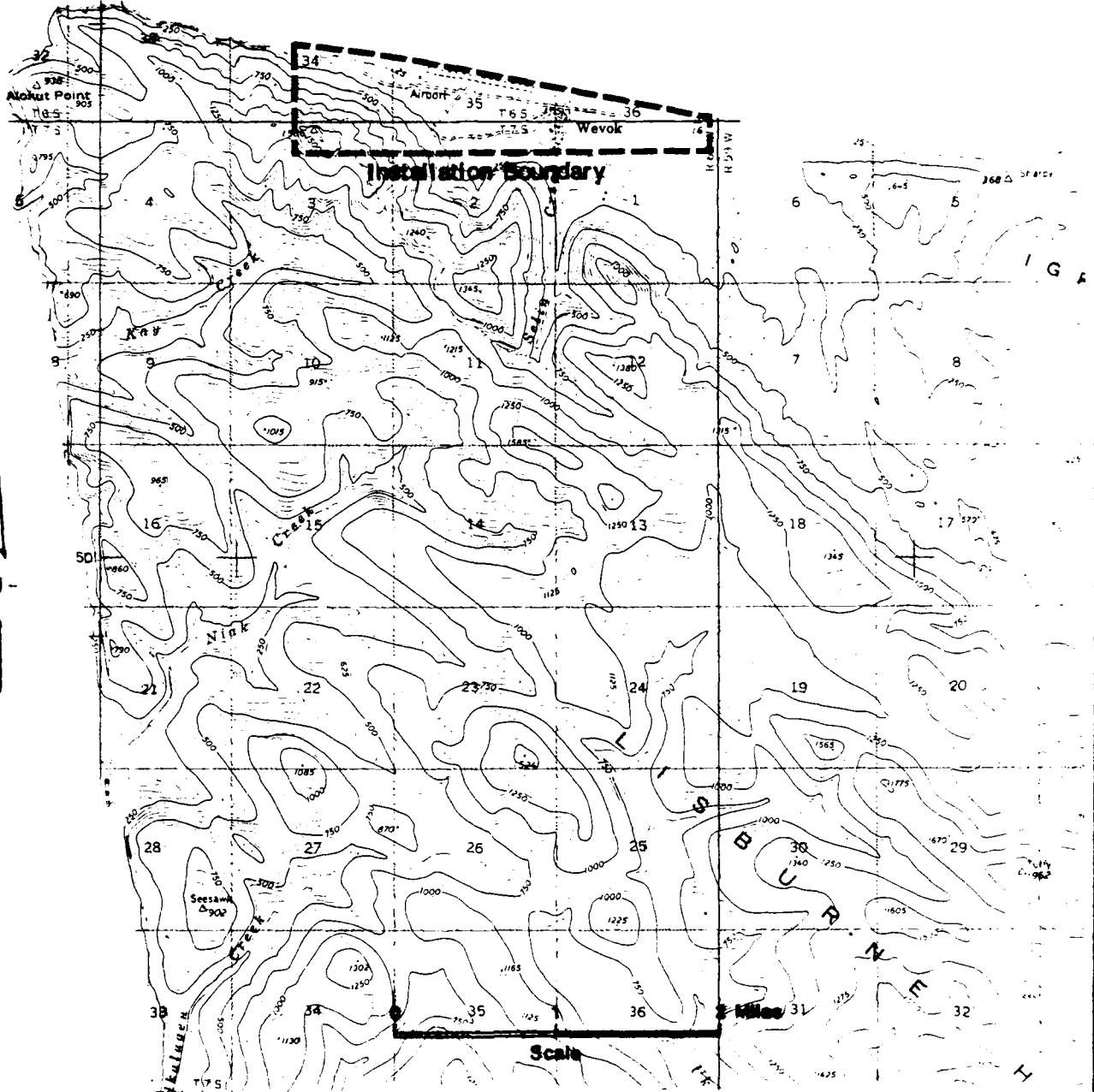
1.2 SITE DESCRIPTION AND SETTING

The Cape Lisburne AFS is located on a peninsula north of Kotzebue Sound on the Chukchi Sea about 1350 km and 950 km northwest of Anchorage and Fairbanks, respectively (Figure 1). The Air Force Station (AFS) consists of approximately 405 hectares surrounded by the Alaska Maritime National Wildlife Refuge (AMNWR). The nearest settlement is Point Hope, a Native Alaskan community about 60 km to the southwest. The topography in the vicinity of the cape is steep and rocky. Selin Creek is found within the boundaries of the installation. The creek flows through the Lower Camp and

CHUKCHI

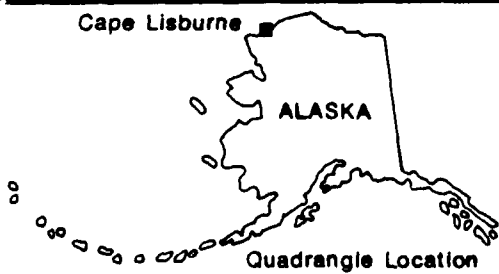
SEA

Cape
Lisburne



Cape Lisburne

ALASKA



CAPE LISBURNE AFS TOPOGRAPHIC MAP

Woodward-Clyde Consultants



Figure
1

Cape Lisburne AFS

enters the Chukchi Sea at a point east of the airstrip (Figure 1). The rugged terrain of the area supports a dwarf, shrubland, alpine tundra.

Cape Lisburne AFS is divided into an Upper and Lower Camp (Figure 2). They are connected by a 6.5 km winding road. An airstrip is located at the Lower Camp and several gravel roads connect the buildings of the camp (Figure 2). The Upper Camp contains a radar facility (Figure 2).

1.3 SITE HISTORY

Cape Lisburne AFS was one of the ten original Aircraft control and Warning (AC&W) sites constructed in Alaska as part of the Air Defense System; it became operational in 1953. In 1957 a White Alice Communications Station (WACS) was added. The WACS was deactivated in 1979 and an Alascom satellite earth terminal system was installed. In 1985 a Minimally Attended Radar (MAR) unit was activated allowing significant staff reduction.

The Phase I report identified six potential sites of contamination at Cape Lisburne (Table 1). Sites 1 and 3 are the sites of a 3000 gallon diesel fuel spill and a 1500 gallon AVGAS spill, respectively. Sites 2 and 4 are previously used dumpsites or waste accumulation areas, site 5 in an area of past runway oiling, and site 6 is the abandoned White Alice site.

ARCTIC

OC

Lower Tram Terminal
(Abandoned)

Airstrip

Runway Oiling
(1950's to 1970's)
Site 5

Tram Line
(Abandoned)

Radome

Upper Tram Terminal
(Abandoned)

Upper Camp

Old Dump Site
Site 21

White Alice Site
(Abandoned)
Site 6

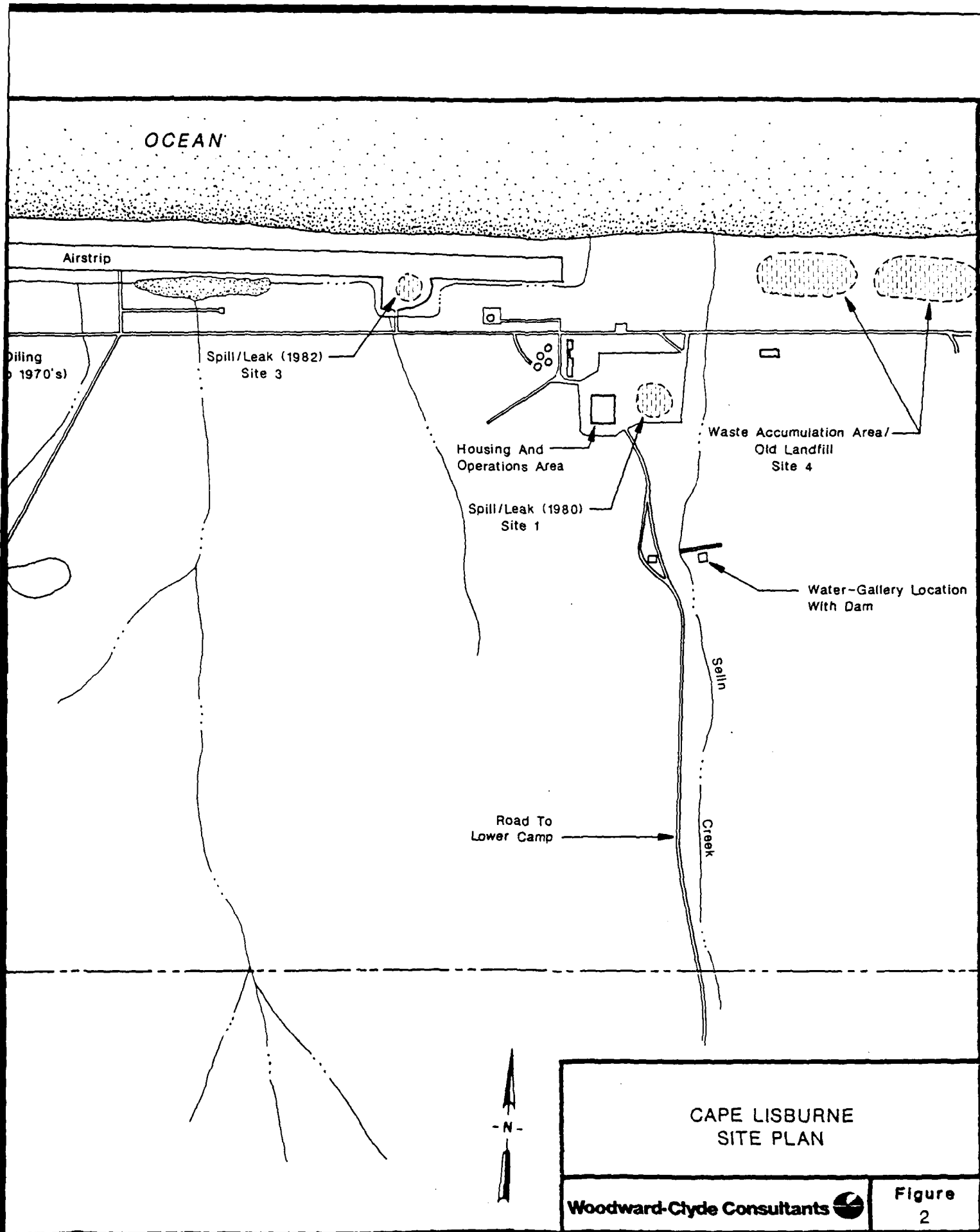
Road To
Lower Camp

Legend:

- Reservation Boundary
- ...- River, Stream

0 400 800 Ft.
Scale

1072



2072

TABLE 1
PHASE 1 FINDINGS

Site Name/No.	Potential Contamination Problems and Remedial History	Recommended Action Phase I
Spill/leak No. 1 (site 1)	Site of a 3,000-gal. diesel fuel spill in 1980. No fuel recovered.	Rated a 71 according to HARM.* Follow-on Action: basic study including test borings, surface water and stream sediment sampling.
Dump No. 2 - Upper Camp (site 2)	Received wastes generated in Upper Camp and White Alice site. Garbage, rubbish, scrap lumber and metal, empty drums and drums containing waste were thrown from the mountain. The area was cleaned in late 1970's.	Rated a 67 according to HARM.* Follow-on Action: surface water and sediment sampling.
Spill/leak No. 2 (site 3)	Site of a 1,500 gal. AVGAS spill in 1982. No cleanup of the spill was performed.	Rated a 66 according to HARM.* Follow-on Action: basic study including test borings to 20 ft.
Waste Accumulation Area No. 2/Dump No. 1 (site 4)	Contiguous areas where waste oils and paint, spent solvents and diesel fuel were stored in drums. Area cleaned and wastes shipped off base in 1977-1978.	Rated a 62 according to HARM.* Follow-on Action: surface water and sediment sampling.
Runway Oiling (site 5)	Practiced as a waste disposal method for dust control from the 1950's to 1978.	Rated a 52 according to HARM.* Follow-on Action: test borings along centerline of runway.
White Alice Site (site 6)	Site deactivated in 1979. Furniture and supplies shipped off base in 1980; structures remain. PCB oils and transformers await shipment off base.	Rated a 49 according to HARM.* Follow-on Action: test borings to 5 ft.

Source: Phase I Engineering Science 1985

*Hazard Assessment Rating Methodology

Cape Lisburne AFS

1.4 CURRENT SITE STATUS

1.4.1 Site Visit

The Cape Lisburne AFS was visited by representatives from the U.S. Air Force and Woodward-Clyde Consultants. The visit took place on August 24, 1987 and was part of a trip to other LRRS installations in Alaska. A written synopsis of the visit is on file with the Alaska Air Command, Elmendorf AFB, Alaska.

Sites visited at Cape Lisburne AFS (Table 2) include two spill/leak areas (sites 1 and 3), an Upper Camp dump area (site 2), a contiguous waste accumulation area and old dump (site 4), an area of runway oiling (site 5), and a White Alice site (site 6). In addition, the field survey team visited the active waste accumulation area at the Lower Camp. This was not identified as a "site" in the Phase I report.

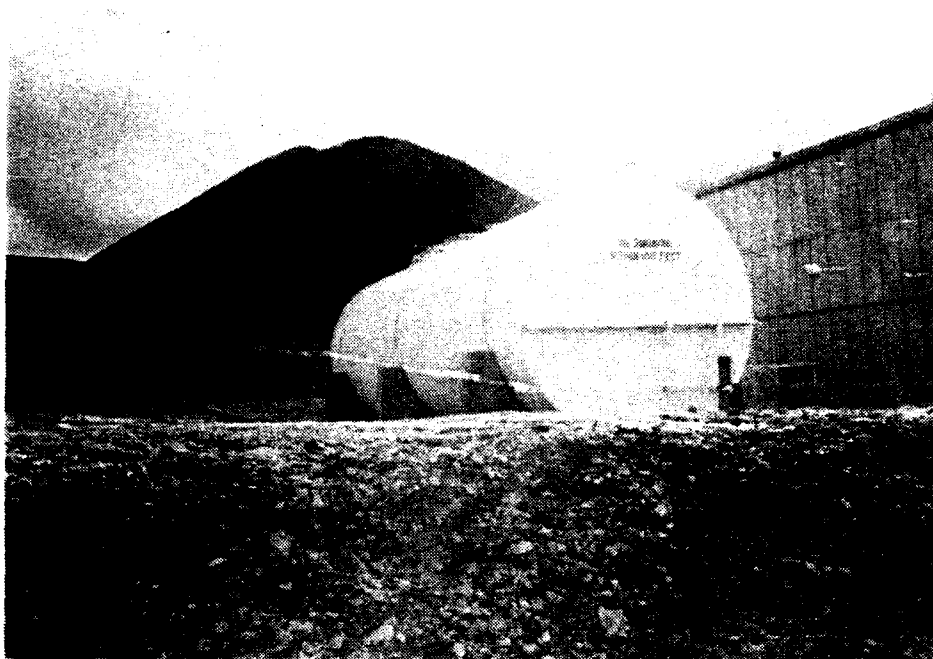
The location of Spill/leak No. 1 (site 1) has been reworked since the spill occurred in 1980. The site is currently occupied by a large fuel tank within a diked enclosure (Figure 3). No evidence of contamination was observed by the field survey team.

Spill/leak No. 2 occurred in the apron area of the runway. No trace of contamination was noted on the apron; this area has been regraded since the spill occurred in 1982. However, the drainage ditch paralleling the runway (Figure 3) exhibited stained sediments ($<18 \text{ cm}^2$) and a slight petroleum odor. The drainage ditch is a high energy system and it is unlikely that significant contamination remains.

Dump No. 2 (site 2) is situated on a steep slope subject to high winds and severe weather. No signs of contamination were apparent. It is likely that any debris noted during Phase I investigations has since been blown from the site.

TABLE 2
SITE VISIT FINDINGS

Site Name/No.	Site Description	Observations	Recommended Action
Spill/leak No. 1 (site 1)	Site of a 3,000-gal. diesel fuel spill in 1980. No clean up; no fuel recovered.	Actual spill site currently occupied by a large fuel tank within a diked enclosure. No evidence of contamination was observed.	No Action.
Dump No. 2 - Upper Camp (site 2)	Located in valley south of Upper Camp. Received garbage, rubbish, empty drums and drums containing waste that were thrown from Upper Camp.	No waste observed.	No Action.
Spill/leak No. 2 (site 3)	Site of a 1,500-gal. AVGAS spill in 1982. No cleanup activities occurred.	Actual spill site has been regraded. Some stained sediments in drainage ditch. Slight petroleum odor. Area affected is less than 18 cm ² .	No Action.
Waste Accumulation Area. /Dump No. 1 (site 4) base.	Contiguous areas. Cleaned in 1977-1978 and wastes shipped off base.	No evidence of contamination or vegetative stress. Standing water in the area was free from odor and clear.	No Action.
Runway Oiling (Site 5)	Occurred from 1950's to 1978. Waste oils spread on runway to control dust.	No visible contamination.	No Action.
White Alice Site (site 6)	Deactivated in 1979. Structures remain. PCB oils and transformers await shipment off base.	No waste observed.	No Action.



Spill/Leak Nos. 1 and 2
Cape Lisburne AFB

Cape Lisburne AFS

Site 4, Waste Accumulation Area No. 2 and Dump No. 1, showed no evidence of contamination or improper landfill operation practices. This area was cleaned and the wastes shipped off base in 1977-1978. Site 4 is contiguous with the station's active landfill. This landfill is permitted until 1990 and is beyond the scope of the IRP studies.

Runway oiling (site 5) has not occurred since 1978. There was no evidence of contamination from this source.

The entire White Alice site (site 6) was deactivated in 1979. However, the buildings and structures remain (Figure 4). Demolition of the White Alice site is scheduled for 1991. Transformers are reportedly stored at the White Alice site awaiting transportation off base. It is not known whether the transformers contain PCB oils. The field survey team did not observe any signs of contamination.

The active waste accumulation area was not assessed under Phase I (Eng. Sci. 1985), but was observed as part of the 1987 site visit. The area was found to be extremely well maintained with no evidence of contamination (Figure 5).

1.4.2 Risk Screening

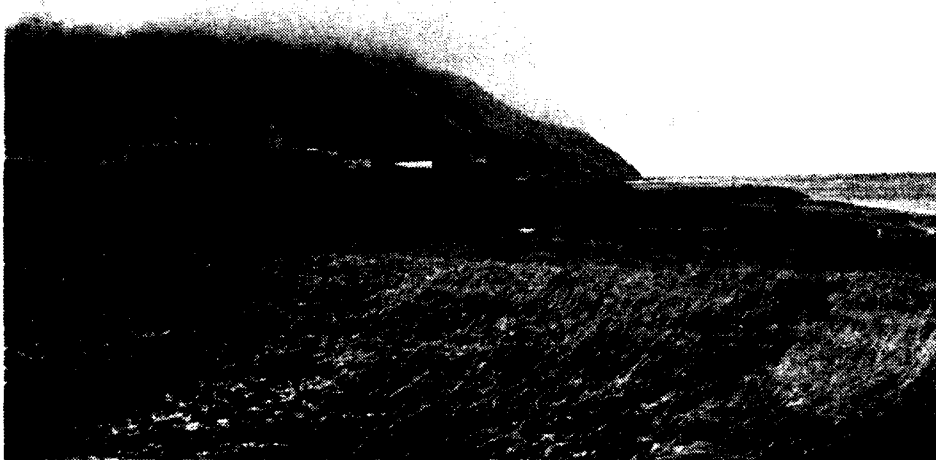
Environmental and health risks were assessed at the sites identified in the Phase I report. Risk was determined to be negligible at all six sites considered at the tier II screening.

1.5 ALTERNATIVES

Alternative actions were considered for all six sites at Cape Lisburne AFS. No further action is the preferred alternative at all sites.



**White Alice Site
Cape Lisburne AFB**



Active Waste Accumulation Area
Cape Lisburne AFB

Cape Lisburne AFS

1.6 CONSISTENCY WITH ENVIRONMENTAL LAWS

The Cape Lisburne AFS was found to be in compliance with the following environmental laws:

- o Resource Conservation and Recovery Act (RCRA)
- o Clean Water Act
- o Safe Drinking Water Act
- o Coastal Zone Management Act.

1.7 CONCLUSION

Based on a comprehensive literature search, observations made during a site visit in 1987, information gathered from government regulatory agencies, and the characteristics of suspected or known contaminants, the health and environmental risks at all six sites assessed at Cape Lisburne were judged to be negligible to low. An analysis of action alternatives determined that no further action was the preferred alternative for all six sites.

2.0 TECHNICAL ATTACHMENTS

2.1 SITE DESCRIPTION

2.1.1 Location

Cape Lisburne is situated on the northwest tip of the Lisburne Peninsula north of Kotzebue Sound on the Chukchi Sea. The cape is at the northern terminus of the Lisburne Hills (Figure 1). Cape Lisburne Air Force Station (AFS) is located 3 km east of the tip of the cape, 56 km northeast of Point Hope, and 1300 km northwest of Anchorage. The installation consists of 405 hectares surrounded by the Alaska Maritime National Wildlife Refuge (NWR), Chukchi Sea Unit. The AFS is at latitude 68°52' north and longitude 166°02' west, and is only accessible by sea or air. The nearest settlement is Point Hope with a population of 600, 95 percent of which is Native (Eng. Sci. 1985, U.S. Census Bureau 1987).

2.1.2 Environmental Setting

2.1.2.1 Geology

Bedrock found at Cape Lisburne AFS is comprised of sandstone, shale, and conglomerates of the Shublik formation (U.S. Department of Interior 1988). The bedrock found 3 km east of the cape which consists of granite, schist, limestone and gneiss, may contribute to the eroded fluvial and alluvial

Cape Lisburne AFS

material found at the AFS. The surficial Quaternary deposits at the installation are composed of coarse and fine-grained deposits associated with moderate to steep sloped mountains and hills. Bedrock exposures are mostly restricted to upper slopes and crestlines (USGS 1960).

The surface deposits of the Lower Camp area are up to 15 m thick, dominated by highly permeable talus and alluvial fan deposits consisting of clay, silt, sand, gravel, cobbles, and large boulders. A moderately well sorted alluvium has been deposited in the channel of Selin Creek (Eng. Sci. 1985). The Upper Camp geology consists of thin, gravelly residuum overlying bedrock at shallow depths; this is typical of steeper slopes (Eng. Sci. 1985).

2.1.2.2 Hydrology

The topography of the Cape Lisburne area is rugged. Steep rocky cliffs plunge from a height of over 200 m into the sea. The topography of the Lower Camp is considerably less rugged. The Upper Camp comprises the steepest part of the installation; the elevation is 470 m and drops to sea level over a distance of 1 km. All stream channels drain directly into the Chukchi Sea or into Selin Creek which drains into the sea. Selin Creek is the main drainage channel within the station boundary (USGS 1952).

The region is underlain with thick, continuous permafrost. The permafrost table was tested at Selin Creek and found to extend from 2 to over 30 m under the surface, well into bedrock (Fuelner and Williams 1967, Williams 1970, Fuelner and Williams 1979). The presence of shallow and continuous permafrost will prevent any solid or fluid contaminant placed or spilled on the ground from permeating deeper than the permafrost zone (CH2M Hill 1981).

Cape Lisburne AFS

The current source of drinking water is a gallery system. The gallery consists of a large vertical pipe connected to a large perforated lateral pipe 6 m below the surface. The perforated lateral pipe serves as a "collecting pan" for water percolating through the alluvium at Selin Creek. The water is pumped out of the gallery and into holding tanks where it is stored for winter and summer use. Historically, the development of functional water sources at Cape Lisburne has been problematic. Much research has been done concerning the drinking water supply at the AFS. In the early 1960's, a groundwater source was created at Selin Creek by using a series of methods to stimulate permafrost thaw in the creek bed alluvium. This complex system created an underground aquifer above the permafrost layer, the upslope and downslope margins of which were artificially dammed (Fuelner and Williams 1967, Williams 1970, Fuelner and Williams 1979).

The system became unproductive by 1976, and a well was drilled into bedrock. The well provided 57 liters of water per minute during the months of March and April. However, production was marginal as a year-round water supply and the present gallery system was installed. The gallery has since been relocated down-slope from its original site, but it continues to be the current source of drinking water for Cape Lisburne AFS (Eng. Sci. 1985). The history of the water supply covers more than 25 years of documented water recovery methods in continuous permafrost regions. It also provides information not generally available on permafrost thaw when the thermal regime is disturbed by humans (Williams 1970, Fuelner and Williams 1979).

2.1.2.3 Biota

The Cape Lisburne AFS is surrounded by the Alaska Maritime National Wildlife Reserve (AMNWR) created in 1980. The Chukchi Sea Unit of AMNWR consists of 120,000 hectares of

Cape Lisburne AFS

coastal and marine area, extending from Point Barrow to the northern margin of the Bering Sea. The seabird colonies at Cape Thompson and Cape Lisburne contain the largest concentrations of birds in the Chukchi Sea Unit, each with over 150,000 breeding birds (U.S. Department of Interior 1988). In this region of AMNWR and inland, approximately 120 species of birds, 65 of them breeders, have been recorded. Several million tufted and horned puffins (Puffinus spp.) nest in AMNWR Chukchi Sea Unit. Other migrant birds that are common to Cape Lisburne include semipalmated and western sandpipers (Ereunetes spp.), semipalmated plover (Charadrius semipalmatus) and golden plover (Pluvialis dominica), common and thick billed murres (Uria spp.), black-legged kittiwakes (Rissa tridactyla), golden eagles (Aquila chrysaetos), and gyrfalcons (Falco Rusticolus). The peregrine falcon (Falco peregrinus), an endangered species, has been spotted at Cape Thompson 90 km south but is not common to the Cape Lisburne area (U.S. Department of Interior 1988). It should be noted that nesting habitat for peregrine falcons was not found during the 1987 site visit nor were there reports uncovered during this study of its existence at the Air Force site.

In addition to birds, 21 species of mammals were recorded in the vicinity of Cape Lisburne. A large post-calving aggregation of caribou (Rangifer arcticus) located near Cape Lisburne. Brown bears (Ursus arctos) are found in the area between mid-April and early November; the Arctic ground squirrel (Citellus parryii) is their principal food source. Some sightings of polar bears (Thalarctos maritimus) in the winter have been noted. Wolverines (Gulo luscus), Arctic foxes (Alopex lagopus), and two species of lemmings (Synaptomys borealis) and (Lemmus trimucronatus) are all commonly found near Cape Lisburne. Walrus (Odobenus rosmarus) have been known to haul out at Cape Lisburne in the late summer when the sea ice has receded to the north (U.S. Department of Interior 1988).

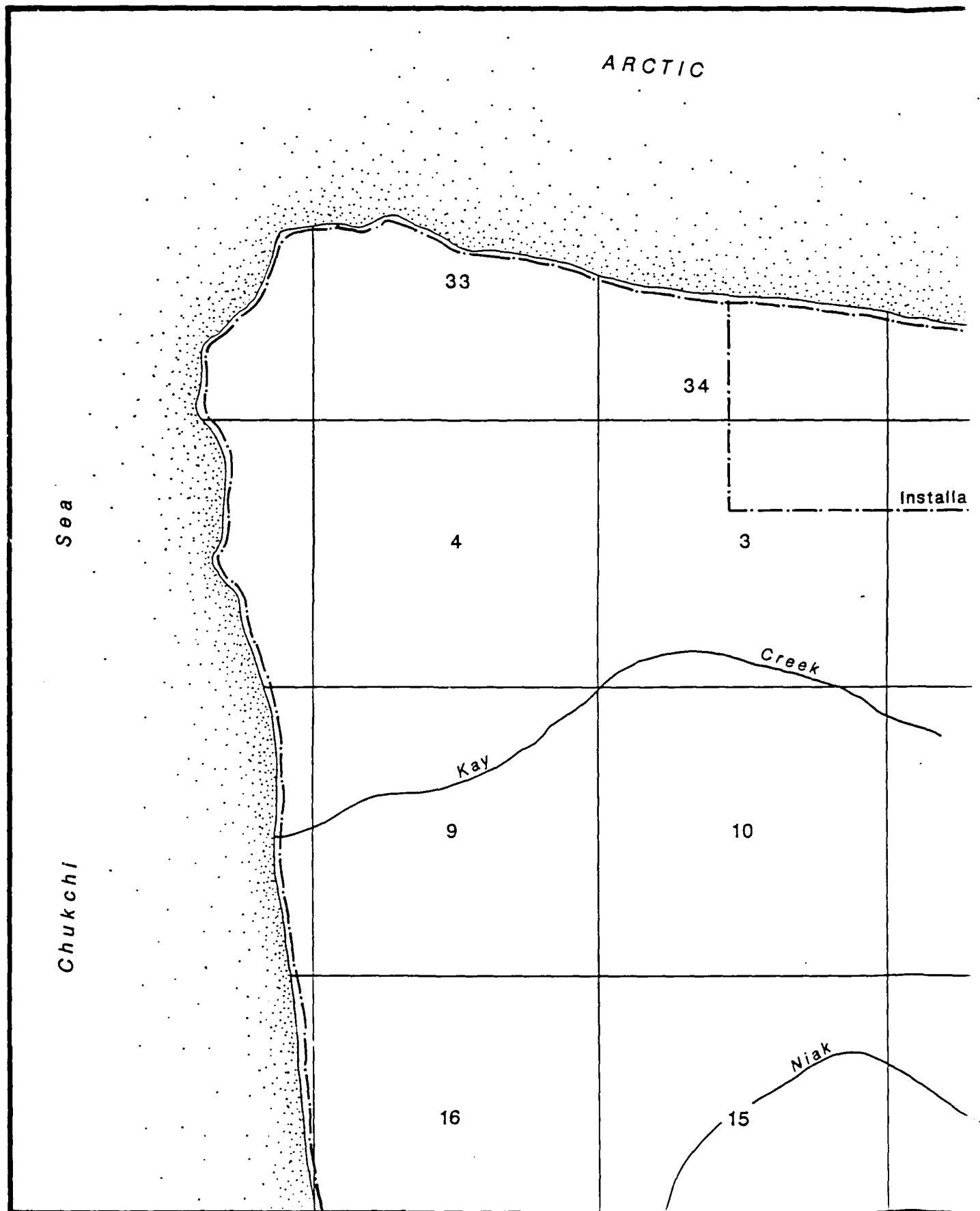
Cape Lisburne AFS

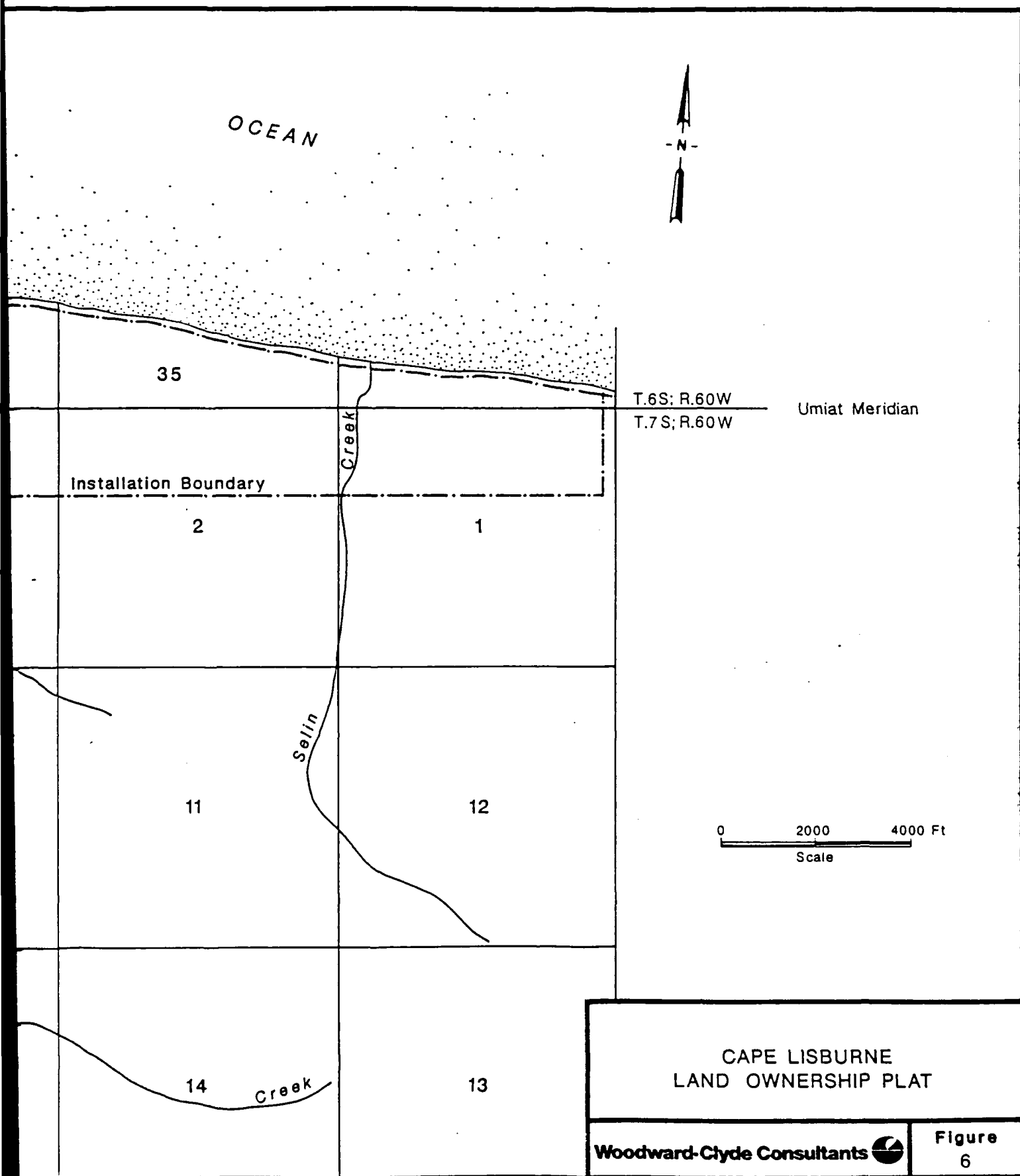
The terrain near the AFS is moderately sloping. The vegetation habitat type is moist tundra in the lower elevations with alpine tundra found in the higher elevations. The predominant flora of this environment type are sedges (Carex spp.), tussocks of cottongrass (Eriophorum spp.) and dwarf shrubs. Dwarf shrubs are less than 1 m high and in the Cape Lisburne area consist of dwarf arctic birch (Betula nana), dwarf willow (Salix spp.), dwarf alder (Alnus spp.), mountain avens (Dryas spp.), crowberry (Empetrum nigrum), labrador tea (Ledum spp.), bearberry (Arctostaphylos spp.), and various herbs, mosses, and lichens (U.S. Department of Agriculture 1972, U.S. Department of Interior 1988, Spetzman 1953).

One plant species that might occur in the Cape Lisburne area is under investigation (Category 2) by the U.S. Department of Interior for endangered species eligibility (Murray 1987). The plant is a small arctic sorrel (Rumex krausei) which has been found near Cape Thompson and on the tip of the Seward Peninsula (Murray 1987). It is not known if this plant occurs within the boundaries of the Cape Lisburne facility.

2.1.3 Site History

Cape Lisburne AFS was one of the ten original Aircraft Control and Warning (AC&W) sites constructed in Alaska as part of the Air Defense System. The installation became operational in 1953 and maintained a military staff of 93. In 1959, 405 hectares were officially set aside for the military site by Public Land Order (PLO) 2034 (Figure 6). A Right of Way was granted in 1958 for the 6 km winding road that connects the Upper Camp and the Lower Camp. A White Alice station was built in 1959 at the Upper Camp, replacing the high frequency radio system. The White Alice station was deactivated in 1979 and replaced with the Alascom-owned satellite earth terminal





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system. The WACS is currently scheduled to be demolished in 1991 (Williams 1988). In 1977, RCA obtained a contract with Alaska Air Command (AAC) which eliminated 80 military positions at Cape Lisburne. A Joint Surveillance System (JSS) was installed in 1982. The system transmitted radar and beacon data by satellite directly to Elmendorf Regional Operation and Control Center (ROCC), eliminating all military positions and permitting total operation of the installation by RCA personnel. The installation of Minimally Attended Radar (MAR) in 1985 allowed for the RCA staff to be reduced to ten positions (Eng. Sci. 1985).

The land surrounding the AFS is part of the Alaska Maritime National Wildlife Refuge (AMNWR), Ann Stevens-Cape Lisburne Subunit of Chukchi Sea Unit which consists of over 120,000 hectares.

2.1.4 Site Operations

Cape Lisburne AFS is divided into an Upper and Lower Camp (Figure 2). A road and a tramway connected the two camps until 1971 when the tramway was deactivated. The active radar facility is located at the Upper Camp; the Upper Camp tram terminal and living quarters have been deactivated. The White Alice Station has also been deactivated and the structures located at the Upper Camp are scheduled to be demolished in 1991. The Lower Camp includes a 1500 m airstrip near the beach, a power plant, a composite building for housing and operations, a gymnasium, a 10-cm POL line extending from the Lower Camp to the beach landing, and several POL and MOGAS tanks distributed around the site (Figure 2). In addition to the WACS, many buildings and facilities, including the sewage lagoon, have been abandoned in recent years (Alaska Air Command Base Map 1986).

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A diesel-burning power plant provided electricity for the installation. A septic system is currently used for treating sewage. Until 1986 sewage was treated in the sewage lagoon by an extended aeration process. The resulting sludge was deposited in the solid waste landfill. The station switched to a septic system because the sewage lagoon proved impractical for only 10 personnel (Humphrey 1987, Williams 1988).

Drinking water is obtained at Cape Lisburne AFS from a gallery system. The gallery consists of a vertical pipe, 1.2 m in diameter and 5.5 m long, connected to a perforated lateral pipe, 1.2 m in diameter and 25 m long, which is buried 6 m beneath Selin Creek. Water collects in the lateral pipe and is pumped into holding tanks for station use. The water can then be pumped around the site to various locations. The drinking water is chlorinated prior to use (USGS Water Resource Div. 1966).

2.1.5 Chemicals Used

Standard operating procedures at Cape Lisburne AFS have the potential to generate hazardous material. Table 3 supplies a list of hazardous materials on inventory at the installation in 1985. The list was compiled by the operator, RCA. Activities using the items in Table 3 include building construction and maintenance, power plant operation and maintenance, vehicle and aircraft maintenance, water purification, use of solvents for cleaning, heat exchange processes, fuel storage and dispensing, and others.

TABLE 3

LIST OF HAZARDOUS MATERIALS ON SITE MAY 1985
AT CAPE LISBURN AFS

MATERIAL NAME	CONTAINER TYPE
Carbon Dioxide	170 lb. cyl.
Oxygen	220 cf. cyl.
Nitrogen	165 lb. cyl.
Freon 12	50 lb. cyl.
CO2 food svce.	138 lb. cyl.
Freon 22	20 lb. cyl.
Freon 12	145 lb. cyl.
Halon 1211	275 lb. cyl.
Oxygen	cyl.
Hyd. fluid	1 gal. cans
Gear lube	1 gal. cans
Hyd. fluid	1 qt. cans
Brake fluid	1 gal. cans
Trans. fluid	5 gal. buck
Deicing fluid	14 oz. cans
Heet	12 oz. p/bot
Auto trans. fluid	1 gal. cans
Oxygen	22 cf. cyl.
Acetylene	1590 cyl.
Spray paint	13 oz. cans
Starting fluid	11 oz. cans
Pet. oil 30W	55 gal. drum
Pet. oil 10W	55 gal. drum
Pet. oil 40W	55 gal. drum
Glycol	55 gal. drum
AVGAS (NOAA)	55 gal. drum
AVGAS (NOAA)	5 gal. drum
Pet. Oil	55 gal. drum
Diesel fuel	55 gal. drum
Nitrogen	615 cyl.
Nitrogen	110C cyl.
Sulf. acid (Elect)	1 gal. bot.
Corr/inhib (CS)	100 bl. C/B drum
Cln comp.	5 gal. can
Paint	1 gal. cans
Isomine	5 gal. P/BOT
Ansul Foray Chem.	5 gal. P/BOT
Dry chem. (F/EXT)	5 gal. can
Foam, Liquid (F/EXT)	5 gal. P/DRM
Genetron 12	30 lb. jug
Sulf. acid	100 lb. drum
Flake caust. soda	100 lb. drum
Calcium hypocl	3 3/4 lb. p/jar
Calcium hypocl	200 lb. drum
Sodium sulfite	100 lb. sack

TABLE 3 (Continued)
LIST OF HAZARDOUS MATERIALS ON SITE MAY 1985
AT CAPE LISBURNE AFS

MATERIAL NAME	CONTAINER TYPE
Paint	1 gal. cans
Paint	5 gal. cans
Spray paint	13 oz. cans
Paint	5 gal. cans
Paint	1 gal. cans
Spray adhes.	24 oz. cans
Paint thinner	1 gal. cans
Surf. Prep.	1 gal cans
Lube oil gear	5 gal cans
Primer Eng. Fuel	8 oz. cans
Hydr. fluid	1 qt. cans
Grease, gear	133 lb. cans
Oil, gen. purp.	1 qt. cans
Panel adhes.	11 oz. tubes
Elect. coating	15 oz. cans
Spray paint	13 oz. cans
Filter spray	13 oz. cans
Corr. prev.	16 oz. cans
Insul. varnish	12 oz. cans
Clean lubr.	6 oz. cans
Permatex	5 oz.
CLF comp. sol.	16 oz.
PL-S lube oil	12 oz.
Spray adhes.	24 oz.
Truflex	16 oz.
Elect. comp.	6 oz.
Starting fluid	11 oz.
Protexem solv.	8 oz.
Ades. epoxy	pints
Fuller	8 oz.
Comp. Elect.	16 oz.

The above itemized hazardous materials include the White Alice site.

Note: These substances are not expected to be found at any Cape Lisburne disposal sites. Hazardous waste materials and substances for retrogradation are transported to Elmendorf AFB. Used oils are containerized to await shipment off site.

Source: RCA/OMS Cape Lisburne

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2.1.6 Previous Studies

The IRP (Installation Restoration Program) was set up as a four-phase program:

- Phase I Problem Identification/Records Search
- Phase II Problem Confirmation and Quantification
- Phase III Technology Base Development
- Phase IV Corrected Action Development

Phase I was completed by Engineering Science in 1985 for the Long Range Radar Stations (LRRS). The report divided the LRRS into a northern and a southern region. Cape Lisburne AFS is one of eight northern region LRR sites considered. The Phase I investigations were prepared for the Air Force Engineering and Service Center in 1985.

2.2 CURRENT SITE STATUS

2.2.1 Findings from Previous IRP Studies

Phase I (Eng. Sci. 1985) considered six potential contamination areas at Cape Lisburne AFS (see Table 1 for site descriptions). Sites 1 and 3 are fuel spill sites, site 2 is the Upper Camp dump area, site 4 is a waste accumulation area and old dump site, site 5 is an area of Lower Camp runway oiling and the White Alice Site is designated as site 6. Engineering Science rated all 6 sites as "Follow-up Action Warranted." The Phase I assessment was based on field inspections, file data, interviews, environmental setting and HARM rating scale (see Table 1).

2.2.2 Observations from Site Visit

Cape Lisburne was visited in August 1987 by representatives of the U.S. Air Force and Woodward-Clyde Consultants. The

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purpose of the visit was to observe current conditions at the six potential contamination sites and to evaluate the conclusions for the Phase I report.

Site 1 is Spill/leak No. 1, an approximately 3,000-gal. diesel fuel spill was reported in 1980. The diesel fuel storage tank adjacent to the power plant was overfilled, resulting in the spillage of fuel onto the ground. No fuel was recovered. At present, the site is occupied by a large fuel tank within a diked enclosure. The field survey team did not observe contamination in the fuel tank area or under the power plant building.

Spill/leak No. 2, site 3, occurred when an AVGAS bladder ruptured on the runway apron in 1982. It is estimated that approximately 1500 gallons of fuel were spilled; no fuel was recovered. Observations of the site by the survey team included no trace or evidence of contamination on the runway apron; it is probable that this area has been reworked and graded since the spill occurred. The team did note some staining of sediments in a drainage ditch that runs parallel to the runway along its south side. The stained sediments were observed in two locations and a petroleum odor was noted. The total area of staining/odor was less than 18 cm². The ditch is expected to be a high energy system and it is unlikely that significant contamination remains.

Dump No. 2 (site 2) is located on a steep slope beneath the Upper Camp radome. Debris and wastes were deposited here in the past, although its use was discontinued in the 1970s. This area is subject to high winds and severe weather. There was no evidence of any debris or wastes. No signs of contamination were apparent.

Site 4, as designated by the Phase I study, includes Waste Accumulation Area No. 2 and Dump No. 1. These areas are

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adjacent to the currently active base landfill. The active landfill is permitted by the Alaska Department of Environmental Conservation, and is beyond the scope of this report. The deactivated waste accumulation area and dump were used until 1977-1978 when cleanup activities occurred. Accumulated waste oils, paint, spent solvents and diesel fuel were removed from the site and shipped off base. Old vehicles, tanks and large metal objects from the dump were used as rip-rap between the beach and runway. The 1987 site visit team saw no evidence of contamination or improper landfill operation practices. There was no evidence of vegetation stress, and in many areas revegetation of the site had occurred. Standing water in the immediate area was clear, free from odor, and exhibited the existence of aquatic life.

Runway oiling (site 5) was discontinued in 1978. No evidence of contamination from this action was visible during the site visit.

The White Alice site (site 6) was deactivated in 1979. Structures such as buildings and antennae remain. These are to be demolished in 1991. There were no visible signs of contamination at the time of the 1987 field visit. Transformers are reportedly stored on site and await transport off base. (Williams 1987).

2.2.3 Findings from the Literature Search

The Phase I report (Eng. Sci. 1985) provides most of the site specific information. The Cape Lisburne area is reported to be underlain by continuous permafrost to a depth of 30+ m (Fuelner and Williams 1967, Williams 1970, Fuelner and Williams 1979). The presence of shallow and continuous permafrost will prevent any solid or fluid contaminant placed

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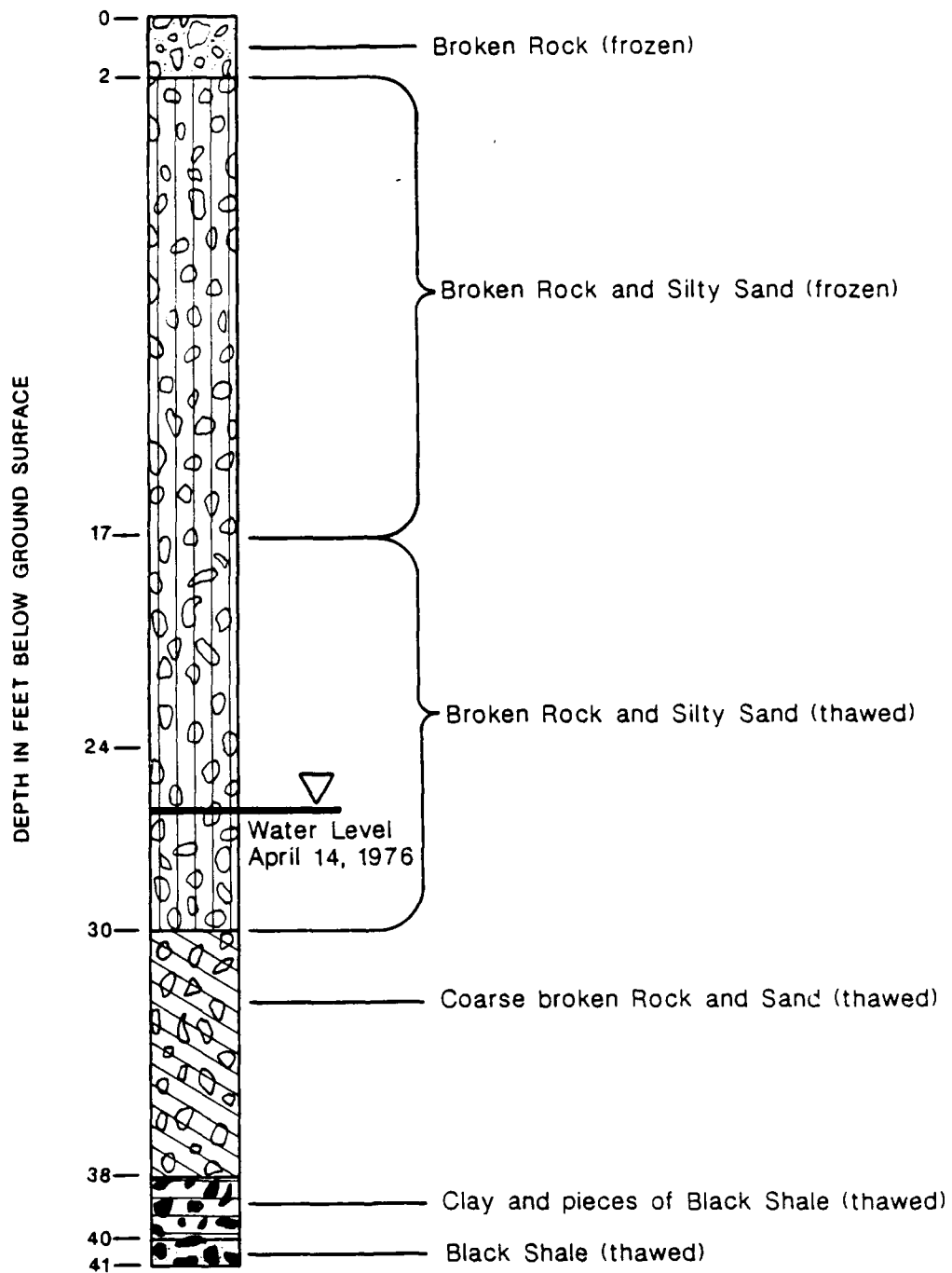
or spilled on the ground from permeating deeper than the permafrost zone (CH2M Hill 1981).

The AFS is located on a gently sloping area adjacent to the more rugged Lisburne Hills to the south. All drainages at the AFS flow north into the sea or into Selin Creek which also flows north into the sea (Eng. Sci. 1985). Almost all the facilities at the Lower Camp are located within 5 to 30 m above mean sea level (USGS 1952).

The permafrost affects the natural ground water supply in the region. In the 1960's, at the AFS, ground water had been obtained by stimulating permafrost thaw in order to create an underground aquifer (Williams 1970). By 1976 the water system had failed and a well was drilled to provide water (Fuelner and Williams 1979). The well also failed and a gallery was installed which serves as the present source of drinking water. The gallery is 6 m deep and serves as a "collecting pan" for shallow water percolation. The water is pumped into holding tanks for use during the winter. The gallery system has been relocated farther down stream in Selin Creek since its advent but is still the current drinking water system (Eng. Sci. 1985).

The Lower Camp area is underlain with up to 15 m of talus and alluvial fan deposits. The deposits are deepest in the creek bed. A well log taken near the Lower Camp shows depth to bedrock at 12 meters (Figure 7).

Climatic conditions are cold, damp, and foggy. The mean annual precipitation at Cape Lisburne is 43 cm (Alaska Weather Service).



Source: Modified from U.S. Geological Survey
Water Resources Division File Data,
Undated.

CAPE LISBURNE AFS WELL LOG

(taken at water gallery location)

Woodward-Clyde Consultants



Figure
7

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2.2.4 Consistency with Environmental Laws

2.2.4.1 Resource Conservation and Recovery Act (RCRA)

Subtitle C - Hazardous Waste Management. Defines hazardous wastes and prohibits disposal except in permitted facilities. Cape Lisburne AFS is in compliance with Subtitle C.

Subtitle D - State or Regional Solid Waste Plans. State or regional permits are required for non-hazardous waste disposal facilities. The current landfill is not in the scope of this report but is permitted until June 12, 1990 by the Alaska Department of Environmental Conservation at which time it must be renewed. The disposal of hazardous substances in the landfill is prohibited by the permit.

2.2.4.2 Clean Water Act

Section 303 - Water Quality Standards and Implementation Plans. This requires water quality standards for all surface waters to be implemented by the states. In Alaska these have been promulgated by ADEC. There is no evidence that State water quality standards are being violated at Cape Lisburne AFS.

Section 311 - Oil and Hazardous Substance Liability. Accidental or intentional discharges of oil and hazardous substances are regulated. Some slight residual evidence of the 1982 fuel spill (site 3) remains; however, the amount of contamination is minute and the station is in compliance with section 311.

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Section 404-Permits for Dredged or Fill Material. Modifications to the wetlands require a Discharge of Dredged or Fill Material Permit from the Army Corps of Engineers. Cape Lisburne is not considered a wetland, and therefore no 404 permits are required.

2.2.4.3 Safe Drinking Water Act

Section 1412 - National Drinking Water Regulations. It is unlikely that drinking water standards as promulgated by the Safe Drinking Water Act (SDWA) will be exceeded by potential contamination at Cape Lisburne AFS.

Section 1413 - State Primacy Enforcement Responsibility. The state of Alaska has assumed primacy for enforcement of the SDWA. The water supply at Cape Lisburne is classified as class C (serving 25 persons or less). A permit is not required nor is monitoring. However, the installation routinely monitors for State primary contaminants and submits results to ADEC. The water supply is Public Water Supply No. 320191.

2.2.4.4 Coastal Zone Management Act

Consistency with the Alaska Coastal Management Program must be demonstrated for all construction initiated after October 1983 within coastal areas in Alaska. A certificate of consistency was issued to Cape Lisburne AFS in June 1984 for the demolition of the White Alice site. The demolition did not occur and is not planned until 1991 (Williams 1988).

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2.3 POTENTIAL CONTAMINANTS

Contaminants which have the potential to exist in the environment at Cape Lisburne AFS include many substances commonly used at LRRS installations. The most important of these are fuels, solvents, PCBs, battery contents, lubricants and oils, and antifreeze. All six sites identified in the Phase I report exhibit historical evidence of contamination. However, contamination was visible only at site 3 during the 1987 site visit. This amounted to some stained sediments in a drainage ditch and a slight petroleum odor. Each site is discussed below.

2.3.1 Spill/Leak No. 1 (Site 1)

This site is the location of an approximately 3000 gallon diesel fuel spill in the powerplant area. No fuel was recovered from the spill. Since the spill occurred, the area has been reworked and covered with a few centimeters of crushed rock and fill material. The area is currently occupied by a large fuel tank within a diked enclosure. The site was assigned a HARM rating of 71 during the Phase I study, although there was no visible sign of contamination during the 1987 site visit. Contaminant data for diesel fuel is provided below.

Diesel fuel has a toxicity rating of 3, corresponding to a moderately toxic level. This rating is based on a toxicity scale of 1-6, 1 being practically non-toxic, and 6 being super toxic (Gosselin, 1984). The probable oral lethal dose to humans is 0.5-5.0 gm/Kg. The components of diesel are virtually insoluble in water. Diesel is derived from the middle distillates of crude petroleum, being composed of hydrocarbons in the C₁₂ to C₂₅ range, with a predominance of 15 to 17 carbon atoms. Diesel fuels typically contain about 30 percent paraffins, 45 percent naphthenes, and 25 percent

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0.80 and 0.85. Its volatility is lower than that of lighter fuels such as gasoline. Consequently, whereas many of the lower molecular weight hydrocarbons have probably volatilized in the last 7 years, other components may have remained in the soil.

2.3.2 Upper Camp Dump No. 2 (Site 2)

This area is situated on a steep slope which received garbage, rubbish, empty drums, and drums containing waste that were apparently thrown from the Upper Camp. The area was cleaned in the late 1970's, and no wastes or visible contamination were observed during the 1987 site visit. Because this is an area of severe weather and high winds, any waste that may have remained at the surface of the dump site would have been blown away.

2.3.3 Spill/Leak No. 2 (Site 3)

This is the site of a 1500 gallon AVGAS spill which occurred in 1982 on the airstrip runway. No fuel was recovered from the spill. The drainage from the spill site is into a ditch running parallel to the airstrip along its south end. The ditch area has been reworked and graded several times since the spill occurred. During the 1987 site visit it was noted that there were some stained sediments and a slight petroleum odor in the drainage ditch area. The affected area is less than 18 cm². Although there is little evidence of significant contamination at this site, toxicity information for AVGAS is provided below.

Aviation gas is a low molecular weight, volatile, petroleum hydrocarbon which will rapidly evaporate. Aviation gas is virtually insoluble in water and is less dense (dens. = 0.71 at 15°C) than water. Therefore, it will float on top of either water or ice and will be rapidly dispersed and

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biodegraded in the environment. The short term inhalation limit for humans is 500 ppm for 30 mins. The ingestion toxicity (LD50) to humans is 0.5-5.0 g/Kg. Aquatic toxicity was found to be 91 ppm/24 hr/juvenile American shad/salt water (Sax 1984).

Gasoline, kerosene, and fuel oils in general are given a toxicity rating of 3. This corresponds to a moderately toxic rating, with a probable oral lethal dose to humans of 0.5-15.0 gm/Kg. The toxicity level of any given fuel is usually based on the content of benzene and other aromatic hydrocarbons, so these parameters must be known in order to adequately classify their toxicity levels. Threshold limit values have been established for gasoline and are given below:

Time-Weighted Average (TWA) Short Term Exposure Limit (STEL)

<u>ppm</u>	<u>mg/m³</u>	<u>ppm</u>	<u>mg/m³</u>
300	900	500	1,500

2.3.4 Waste Accumulation Area No. 2 and Dump No.1 (Site 4)

These two areas are contiguous and were used to store waste oils and paint, spent solvent and diesel fuels. The site has been cleaned and wastes shipped off base in 1977-78. There was no evidence of improper landfill practices, contamination, or vegetation stress during the 1987 site visit. Standing water in the area was clear and free of odor. This site is now contiguous with the station's active landfill which is permitted and beyond the scope of these studies.

2.3.5 Runway Oiling (Site 5)

Runway oiling was done at Cape Lisburne from the 1950's-1978 as a dust palliative and disposal method. There was no

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evidence of contamination from this source during the 1987 site visit.

2.3.6 White Alice Site (Site 6)

This communications site showed no signs of visible contamination during the 1987 site visit. The transformers remaining at the site are believed to contain PCB oils, and these await shipment off base. Since there is no historical evidence of waste contamination at this site, follow-on action is not recommended.

2.4 CONTAMINANT MOVEMENT

2.4.1 Spill/Leak No. 1 (Site 1)

No evidence of diesel fuel contamination moving or migrating from the site was reported in the Phase I investigation or the 1987 site visit. This area is currently occupied by a fuel tank within a diked area.

Diesel fuel is relatively insoluble in water. Furthermore, adsorption of diesel fuel constituents on organic soils can be significant. Thus, once fuel is spilled, especially on soil with high humic content such as the peats in Alaskan tundra, migration is unlikely except where hydraulic gradients are sufficiently steep. Once infiltration has taken place, lateral migration is negligible because of the hydrophobic characteristics of petroleum compounds typical in diesel, and the adsorptive capacity of humic soils.

Because of the low volatility of diesel fuel, particularly after many years of weathering, air transport of hazardous substances from a spill is not a significant concern. Biodegradation and chemical transformations, as well as physical processes such as volatilization and differential

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adsorption on soils, will occur in fuel spills. The possible exposure to environmental receptors is negligible and human exposure to hazardous levels is possible only through direct ingestion of contaminated soils.

2.4.2 Upper Camp Dump No 2 (Site 2), and Waste Accumulation Area No. 2/Dump No 1 (Site 4)

Both of these sites showed no sign of waste and are no longer used. Site 2 was the site of past dumping of miscellaneous garbage and drummed wastes. The potential for contaminant migration downslope of the site exists but there is no current evidence of debris or waste. Neither site showed vegetative stress and both have been recommended for no further action.

2.4.3 Spill/Leak No.2 (Site 3)

This is the site of a 1500 gallon AVGAS spill in 1982. Petroleum products such as AVGAS undergo alterations from physical, biological, or chemical processes occurring over time frames ranging from days to years. The magnitude of transformation increases with time. Although the biodegradation and physical processes proceed at slower rates in the arctic than in warmer climates, a substantial change in composition of materials is likely to have occurred during the last 5 years. Evaporation and dissolution are important physical processes. In addition, photochemical and microbial oxidations are possible. Weathered petroleum products generally exhibit the following characteristics:

- o Loss of low boiling hydrocarbons from evaporation.
- o Loss of low boiling hydrocarbons from dissolution.

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- o Increase of relative proportions of naphthenic compounds.
- o Increase in relative proportions of highly branched alkylated compounds from biodegradation relative to straight chain compounds.
- o Increase in relative proportions of polycyclic compounds relative to saturated compounds.

As petroleum hydrocarbons age or weather, the most persistent compounds, polycyclic aromatic hydrocarbons, remain the longest. These compounds may be slowly removed by biodegradation, biotransformation, photolytic, or oxidative processes.

The rate of biodegradation of the weathered petroleum hydrocarbons slows substantially as the molecular weight increases. For instance, naphthalene has a half-life of 5 hours under controlled microbial transformation experiments. Under the same conditions, benzo[a]pyrene will require 21,000 hours to degrade by one half. The relative mobilities of these two materials show a similar relationship. Naphthalene is much more mobile than the more complex ring system of benzo[a]pyrene.

2.4.4 Runway Oiling (Site 5)

Runway oiling was concluded in the late 1970's. It is possible that waste oils from the oiling actions migrated into the drainage. Since the 1970's any contaminants that did migrate into the streams and drainages have since been transported off site or have been sufficiently degraded. Contaminants may have migrated in airborne dust particles from the runway. However, since the surface disposal of oil brings the oil into contact with organisms which readily biodegrade

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most petroleum hydrocarbons, only the insoluble and immobile polynuclear aromatic hydrocarbon (PAH) portion remains. PAHs are readily adsorbed onto humic, carbon-rich soils. These hazardous materials are slowly degraded by photolytic, oxidative and biological processes. In some circumstances, lower molecular species such as naphthalene will sublime (a form of evaporation) and be removed from the surface environment. The 1987 site visit found no evidence of residual contamination. Further consideration of migration pathways is not provided since the tendency for current levels of contaminants to migrate are inconsequential. For these reasons, no additional action is recommended at site 5.

2.4.5 White Alice Site (Site 6)

This site was deactivated in 1979 and has showed no historical evidence of contamination. Transformers containing PCB oils await removal from the site but there have been no reports of leaks or spills. Therefore, the potential for contaminant movement does not exist at this site and no further action is recommended.

2.5 QUALITATIVE RISK SCREENING

2.5.1 General Approach

This is a qualitative risk screening of contamination at Cape Lisburne. The screening is qualitative because it relies on field observations and indirect data evaluations rather than direct and quantitated field or laboratory measurements. Many quantitative methodologies for risk screening are available ranging from statistical probability evaluations to numerical rating systems. However, an initial qualitative screening is necessary to justify the expense and effort necessary to satisfy the data requirements of more rigorous quantitative

approaches. The purpose of this section is to provide that initial screening.

2.5.2 Definition of Risk

Risk is "the probability that a consequence of defined magnitude will occur." The three key concepts of this definition are probability, consequence and defined magnitude. Each is discussed below:

- o Probability - According to the above definition of risk, the mere presence of a hazardous substance at a site does not constitute significant risk; risk is the probability of adverse effects to humans or other receptors exposed to the hazardous substance. When that probability is negligible, risk will be considered to be negligible. Conversely, when that probability is not negligible, identifiable risks will be assumed to be present. Thus, probability is evaluated qualitatively rather than quantitatively in this document.
- o Consequence - A consequence is an adverse effect on a receptor(s) caused by exposure to oil or hazardous substances. Receptors can be human or environmental resources. Environmental receptors include surface water, ground water, air, soils, vegetation or wildlife. For a receptor to be adversely affected by a contaminant, three general conditions must be met. First, contamination must be present in the environment. Second, the receptor must be exposed to that contaminant. Exposure is a function of contaminant release mechanisms, paths of migration, and chemical fate processes. Third, adverse effects are possible only if receptors are exposed to sufficient quantities of contaminant and for sufficient intervals of time. This third condition introduces the concept of effect threshold, or the level

of exposure necessary to cause an effect. For thresholds to be exceeded, toxicity of contaminants must be sufficiently high, their quantities or concentrations sufficiently large, and their durations/frequencies of contact with receptors sufficiently long to cause adverse impacts. The assessment procedure used here estimates the qualitative probability of these three conditions being present at a site.

- o Defined Magnitude - What constitutes an adverse effect must be established. That is, the magnitude of effect necessary to qualify as adverse or as a consequence must be defined. In general, for an effect to be considered adverse, it must be of sufficient magnitude to create health hazards, cause exceedences of environmental and health standards or regulations, or lead to significant environmental perturbations.

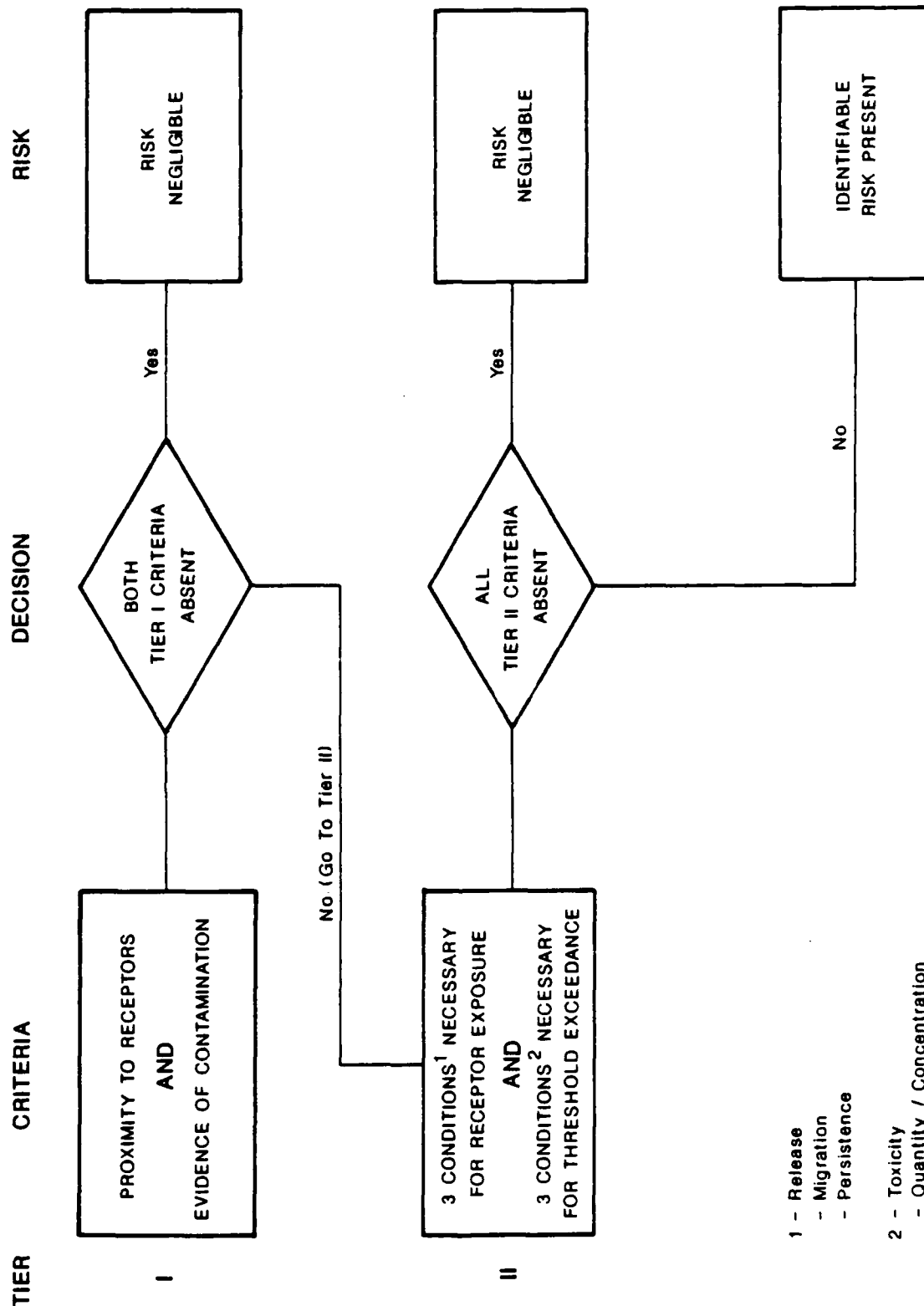
2.5.3 Specific Approach

By the above definition, risk can be either negligible, or present. For those sites assigned a negligible risk, no further action will be recommended. For sites where risks are present a preferred remedy will be selected from two or more alternatives. One of these alternatives may be "No Further Action." For no further action to be recommended at a site that has identifiable risks, one of the following conditions must be met:

- o the hazards created by remedial action or further study outweigh those presently existing at the site or,
- o the cost of remedial action or further study is not cost effective.

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For the purposes of assigning risk levels to a site, a two-tiered hierarchical decision scheme is employed (see Figure 8). At tier I, an initial screening of the presence of contaminants and the proximity of sensitive receptors is made. This determination is made by reviewing historical records, observations from the site visit, and published reports or data. If the available evidence does not indicate that contaminants have been release at the site and if the site is not close to sensitive receptors, then the probability of risk is considered negligible. In this case a no further action alternative will be recommended. However, if it is concluded that the site is, or possible has been, contaminated with hazardous or toxic substances or if the site is in close proximity to sensitive receptors, the screening proceeds to tier II. The approach to tier II is deductive. First, receptors and the conditions necessary for exposure must be identified. Second, the conditions necessary for exceedences must be established. These two types of conditions constitute a basic definition of risk at each site. Then the actual conditions at the site are compared to this definition. In actuality, all the specified conditions must be present for significant risk to exist. If one condition is absent, than it could be argued that risk is necessarily negligible. However, the risk screening procedure used here is conservative in that it assumes a negligible risk only if all the conditions are absent. If all the necessary conditions are absent, then a negligible risk is clearly deduced. Likewise, if the status of a specified condition cannot be determined at a site but there is no reason to suspect that it exists, and all other conditions are absent, the site will be assumed to have negligible risk. If one or more of the conditions are present or suspected, then the site will be said to represent some identifiable level of risk.



FLOW DIAGRAM SHOWING
TWO LEVELS OF RISK SCREENING
AND CRITERIA FOR DECISION
MAKING AT EACH LEVEL



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2.5.4 Logic Supporting the Assessment

Prior studies identified six sites at Cape Lisburne to have the potential to be contaminated with various wastes. However, during the 1987 site visit only site 3 showed any sign of contamination. Both dump sites (2 and 4) and the White Alice area (Site 6) showed no sign of improper dumping practices or visible contamination during any phase of study. For areas of known spills or leaks (sites 1,3, and 5), the potential hazards and conditions necessary to produce them were identified. The conditions necessary to allow exposure of receptors to threshold levels of contaminants are listed in Table 4. Finally, conditions at the site were compared with hypothetical "necessary conditions." Table 4 summarizes the conclusions of the risk screening. The rationale for the probability screenings of sites 1,3, and 5 are discussed in detail below.

2.5.4.1 Spill/Leak No.1 (Site 1)

This is the site of a 1980 diesel fuel spill of approximately 3000 gallons. Although there was no visible evidence of contamination at the site, a tier II screening was performed. The potential receptor for this site is Selin Creek and the Chukchi Sea. The following assessment of conditions necessary for adverse effects is an evaluation of the potential for receptors to be significantly exposed to contaminants.

- o Release Mechanisms - The contaminants could be released from their present location by volatilization, by mobilization with solvents, or by mechanical transport of affected soils as a result of intentional human disturbances or erosion. Most volatilization that is possible would have occurred by now. Additional volatilization in significant amounts is unlikely

TABLE 4

RISK SCREENING FOR CAPE LISBURN SITES
TIER I SCREENING - EVIDENCE OF CONTAMINATION AND RECEPTORS

TIER I CRITERIA	Site					
	1	2	3	4	5	6
Is Site in Close Proximity to Sensitive Receptors?	YES	YES	YES	YES	YES	YES
Is Evidence of Contamination Present at Site?	NO	NO	NO	NO	NO	NO
Both Criteria Absent?	NO	NO	NO	NO	NO	NO
Risk	Go to Tier II	Go to Tier II	Go to Tier II	Go to Tier II	Go to Tier II	Go to Tier II

TABLE 4 cont.

TIER II SCREENING - EVIDENCE OF CONDITIONS NECESSARY FOR A CONSEQUENCE OF DEFINED MAGNITUDE

TIER II CRITERIA	Site					
	1	2	3	4	5	6
<u>3 Conditions Necessary for Receptor exposure:</u>						
Significant Release Mechanisms	NO	NO	NO	NO	NO	NO
Significant Migration Pathways	NO	NO	NO	NO	NO	NO
High Persistence	NO	NO	NO	NO	NO	NO
<u>3 Conditions Necessary for Threshold Exceedances:</u>						
Moderate to High Toxicity Relative to Receptors and Likely Routes of Exposure	NO	NO	NO	NO	NO	NO
Quantity/Concentration Sufficient to Exceed Env., Health, Toxicity Standards	NO	NO	NO	NO	NO	NO
Duration and Frequency of Exposure Sufficient to Cause Adverse Health/Env. Effects	NO	NO	NO	NO	NO	NO
All Criteria Absent or Unknown?	YES	YES	YES	YES	YES	YES
RISK	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE

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because of present chemical/physical characteristics of the fuel and low mean annual temperatures. A large solvent spill would be required to solubilize components in the diesel spill and to transport them off-site. This is an unlikely event.

- o Migration Pathways - Ingestion of contaminated soil by humans is unlikely. The major pathway to human exposure is by air transport. However, the volatile fractions of the spill have volatilized by now and accumulations of threshold air concentrations are unlikely. Other potential pathways to human and environmental receptors include surface or subsurface migration into surface and ground waters. Since the site is underlain by shallow permafrost, little to no vertical migration can be expected, particularly because of the insolubility of the remaining diesel fractions and their relatively high soil adsorptivities.
- o Persistence - The age of the spill at site 1 is such that significant weathering, chemical transformation and biodegradation have probably already taken place and will continue. The volatile lower molecular weight compounds, which are the most soluble, would have largely volatilized by now. The potential contaminants in their present location cannot be characterized as persistent.
- o Toxicity - Diesel fuel has been assigned a toxicity rating of 3, corresponding to a moderately toxic level. If ingested, it would be expected to have moderate to high toxicity. The possibility of ingestion, however, is unlikely. Toxicity to aquatic species is not significant because diesel fuel components are relatively insoluble in water. Standard action levels for diesel spills in soils do not exist.

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- o Quantity/Concentration - The reported spillage was 3000 gallons on one occasion. This is not of sufficient quantity to pose a hazardous impact to aquatic receptors.
- o Duration and Frequency of Exposure - Surface waters of Selin Creek may have been exposed to contaminants from the spill. It is improbable that humans would be exposed to toxic concentrations of contaminants either orally, dermally, or through respiratory routes. If exposure occurred, it would be of short duration and very infrequent.

It is concluded that there is a negligible probability of significant exposure of receptors to diesel fuel at site 1. No further action is recommended.

2.5.4.2 Spill/Leak No.2 (Site 3)

This is the site of a 1500 gallon AVGAS spill which occurred in 1982. Although there was only minor evidence of contamination in the form of stained sediments in the nearby drainage ditch, a tier II screening was performed. The following assessment of conditions necessary for adverse effects is an evaluation of the potential for receptors to be significantly exposed to contaminants.

- o Release Mechanisms - The contaminants in AVGAS could be released from their present location by volatilization, mobilization with solvents, or by mechanical transport of affected soils. AVGAS is highly volatile and any volatilization that is possible would have occurred by now. Additional volatilization in significant amounts is unlikely due to the low mean annual temperatures. A large solvent spill would be required to solubilize the remaining components in AVGAS. This is an unlikely event.

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- o Migration Pathways - Ingestion of contaminated soil by humans is unlikely. The major pathway to human exposure is by air transport. However, the volatile fractions of the spill have volatilized by now and accumulations of threshold air concentrations are unlikely. Other potential pathways to human and environmental receptors include surface or subsurface migration into surface and ground waters. Since the site is underlain by shallow permafrost, little to no vertical migration can be expected.
- o Persistence - The age of the spill at site 3 is such that significant weathering, chemical transformation, and biodegradation have probably already taken place and will continue. The volatile lower molecular weight compounds, which are the most soluble, would have largely volatilized by now. The potential contaminants in their present location cannot be characterized as persistent.
- o Toxicity - AVGAS has been assigned a toxicity rating of 3, corresponding to a moderately toxic level. If ingested, it would be expected to have moderate to high toxicity. The possibility of ingestion, however, is unlikely. Toxicity to aquatic species is not significant because AVGAS components are relatively insoluble in water. Standard action levels for AVGAS spills in soils do not exist.
- o Quantity/Concentration - The reported spillage was 1500 gallons on one occasion. This is not of sufficient quantity to pose a hazardous impact to aquatic receptors.
- o Duration and Frequency of Exposure - Surface waters of Selin Creek may have been exposed to contaminants from the spill. It is improbable that humans would be exposed to toxic concentrations of contaminants either orally,

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dermally, or through respiratory routes. If exposure occurred, it would be of short duration and very infrequent.

It is concluded that there is a negligible probability of significant exposure of receptors to AVGAS at site 3. No further action is recommended.

2.5.4.3 Runway Oiling (Site 5)

Visual evidence of contamination from runway oiling was not observed during the site visit, but a tier II screening was performed because of historical evidence. The following assessment of conditions necessary for adverse effects is an evaluation of the potential for receptors to be significantly exposed to contaminants.

- o Release Mechanisms - Runway oils could be released by mobilization with solvents or by mechanical transport of affected soils. A large solvent or fuel spill would be required to solubilize non-polar hydrocarbons and to transport them into surface or ground waters. This is improbable. Given the moderate amount of precipitation, any water soluble compounds have probably been leached from the soil. Others with higher adsorption coefficients would tend to remain in the soil. Intentional or erosive movement of soil is unlikely.
- o Migration Pathways - Ingestion of contaminated soil by humans is unlikely. Due to the age of possible contamination, mobilization would be improbable and the existence of migration pathways extremely limited.
- o Persistence - Oil is not persistent in the environment. It is subject to weathering, chemical transformation and biodegradation.

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- o Toxicity - Lube oil is not toxic unless ingested in large quantities.
- o Quantity/Concentration - There is no evidence of the volume of oil used as a dust suppressant. The lack of visual evidence of contamination indicates that minimal quantities were applied to the runway.

2.6 ALTERNATIVE ANALYSIS

2.6.1 Purpose

The Comprehensive Environmental Response and Compensation Liability Act (CERCLA, as amended by the Superfund Amendments and Reauthorization Act--SARA) govern federal agency response to contamination of federal facilities by oil or hazardous substances. The National Contingency Plan calls for cost-effective remedies to be implemented for sites where a significant risk to human health or the environment is shown to exist; such sites are enrolled on the "National Priority List" (called NPL). Guidance for selecting cost-effective remedies for NPL sites is available in EPA document EPA/540/G-85/003, "Guidance for Feasibility Studies Under CERCLA," and EPA memorandum "Interim Guidance on Superfund Selection of Remedy" (Porter, 10/24/86). No specific guidance exists for selecting cost-effective remedies for non-NPL sites such as those at Cape Lisburne. The alternatives analysis presented in the following paragraphs is modeled after the above-referenced EPA guidance, and is generally in compliance with the requirements of the National Contingency Plan (40 CFR 300).

2.6.2 Evaluation Criteria and Method

EPA guidance ("guidance for Feasibility Studies Under CERCLA and Guidance on Superfund Selection of Remedy") describes an

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evaluation method for alternative remedies that includes the following objectives:

- o Remedies must be protective of human health and environment.
- o Remedies should attain Federal and State public health and environmental requirements.
- o Remedies must be cost effective, and
- o Remedies must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent possible.

To meet these standards, the following evaluation criteria are presented:

- o Performance level (how effective will the alternative be in abating the hazard, and in reducing risk)
- o Useful life (how long will the alternative last)
- o Risk of increased exposure (will the alternative create new opportunities for receptors to be exposed to contaminants)
- o Environmental impact (will the alternative cause disturbance or loss of environmental resources)
- o Cost (Rough, Order-of-Magnitude cost is used: is the economic cost of the alternative low, moderate or high).
- o Implementability (what infrastructural, administrative or logistic requirements does the alternative have).

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- o Institutional impacts (does the alternative place a burden on local community institutions)
- o Socioeconomic impacts (does the alternative affect employment, housing, or other socioeconomic factors)
- o Safety (what is the health risk to site workers and surrounding residents of the alternative remedial measure)
- o Reliability (what are the maintenance, inspection and replacement requirements of the alternatives).

The last four evaluation factors are not considered in the evaluation below for the following reasons. Institutional factors are not relevant because no local community institutions or interactions are involved. Socioeconomic impacts are not relevant because the sites are not economically interactive with local communities; the remedial alternatives considered are relatively specialized and would not present employment or income opportunities to local communities. Safety impacts are not relevant because none of the known or potential contamination problems and none of the alternative actions present a significant risk to workers or residents of the sites. Reliability is not a relevant factor because none of the alternatives are active treatment systems or have any maintenance or replacement requirement.

The six evaluation factors (the first six in the list above) will be applied to each alternative at each site, using a tabular format with the following headings:

- o Alternative;
- o Performance Level;
- o Useful Life;
- o Risk of Increased Exposure;

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- o Environmental Impact;
- o Rough Order of Magnitude (ROM) Cost;
- o Implementability.

The alternatives will be ranked based on a qualitative scoring that considers performance level, useful life and risk of increased exposure to be relatively more important than environmental impact. Environmental impact will be considered to be relatively more important than ROM cost and implementability.

2.6.3 Alternatives to be Evaluated

At least three alternatives were considered at each of the nine sites evaluated at tier II in the risk screening. These sites were evaluated at tier II because of the proximity of the sites to the Beaufort Sea which is a sensitive receptor. These alternatives are presented below for each of the sites.

2.6.3.1 Spill/Leak No. 1 (Site 1)

- o No further action.
- o Testing up and down gradient.
- o Further investigation of the site consisting of test borings in and around the site to determine the level and extent of potential contamination by chemical and physical testing..
- o Further investigation followed by excavation and removal of potentially contaminated soils.

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2.6.3.2 Upper Camp Dump No. 2 (Site 2)

- o No further action.
- o Further investigation of the site consisting of test borings in and around the site to determine the level and extent of potential contamination by chemical and physical testing.
- o Further investigation followed by excavation and removal of potentially contaminated soils.

2.6.3.3 Spill/Leak No. 2 (Site 3)

- o No further action.
- o Further investigation of the site consisting of test borings in and around the site to determine the level and extent of potential contamination by chemical and physical testing.
- o Further investigation followed by excavation and removal of potentially contaminated soils.

2.6.3.4 Waste Accumulation Area No. 2 and Dump No. 1 (Site 4)

- o No further action.
- o Further investigation of the site consisting of test borings in and around the site to determine the level and extent of potential contamination by chemical and physical testing.
- o Further investigation followed by excavation and removal of potentially contaminated soils.

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2.6.3.5 Runway Oiling (Site 5)

- o No further action.
- o Further investigation of the site consisting of test borings in and around the site to determine the level and extent of potential contamination by chemical and physical testing.
- o Further investigation followed by excavation and removal of potentially contaminated soils.

2.6.3.6 White Alice Site (Site 6)

- o No further action.
- o Further investigation of the site consisting of test boring in and around the site to determine the level and extent of potential contamination by chemical and physical testing.
- o Further investigation followed by excavation and removal of potentially contaminated soils.

2.6.4 Results

The following results are presented for each site evaluated in tier II screening in table format as described in section 2.6.2 of this report. The preferred alternative for each site is no action.

2.6.4.4.1 Spill/Leak No. 1 (Site 1)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

2.6.4.4.2 Upper Camp Dump No. 2 (Site 2)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

2.6.4.3 Spill/Leak No. 2 (Site 3)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

2.6.4.4 Waste Accumulation Area and Dump No. 1 (Site 4)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

2.6.4.4.5 Runway Oiling (Site 5)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

2.6.4.4.6 White Alice Site (Site 6)

Alternative	Performance Level	Useful Life	Risk of Increased Exposure	Environ. Impact	ROM Cost	Implement-ability
No Action	Low	High	Negligible	Negligible	Negligible	Good
Investigation	Low	High	Low	Moderate	High	Poor
Investigation/ Excavation	Low/High	Low/High	Low	Moderate	High	Poor

Preferred Alternative: No Action

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2.7 SUMMARY

All of the sites considered in the risk screening were evaluated at the tier II level. The no action alternative is the preferred alternative because it presents the lowest or same risk to human health as other alternatives. The no action alternative also has a lower environmental and economical cost than any other alternative at each of the sites.

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